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9
EXAMINER

CANTELMO, GREGG

ART UNIT	PAPER NUMBER
	1745

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application N .	Applicant(s)
	10/046,499	KUHR ET AL.
	Examiner	Art Unit
	Gregg Cantelmo	1745

-- The MAILING DATE of this communication appears in the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 27 May 2003.

2a) This action is **FINAL**. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

4) Claim(s) 1-117 is/are pending in the application.

4a) Of the above claim(s) 71-117 is/are withdrawn from consideration.

5) Claim(s) _____ is/are allowed.

6) Claim(s) 1-70 is/are rejected.

7) Claim(s) _____ is/are objected to.

8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on 26 October 2001 is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All b) Some * c) None of:

1. Certified copies of the priority documents have been received.

2. Certified copies of the priority documents have been received in Application No. _____.

3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) The translation of the foreign language provisional application has been received.

15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) Notice of References Cited (PTO-892)

2) Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4 & 6.

4) Interview Summary (PTO-413) Paper No(s). _____.

5) Notice of Informal Patent Application (PTO-152)

6) Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I, claims 1-70 in Paper No. 9 is acknowledged. The traversal is on the ground(s) that there is no serious burden of search. This is not found persuasive because the product claims are not limited to the process claims and therefore the search for the product does not require a search for the process since the product may be made by materially different processes.

The requirement is still deemed proper and is therefore made FINAL.

Information Disclosure Statement

2. The information disclosure statements filed January 7, 2003 and April 21, 2003 have been placed in the application file and the information referred to therein has been considered as to the merits.

3. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

For example, on page 26, paragraph [0123] the specification refers to WO 01/03126. This reference has not been cited on a form PTO-1449 by Applicant and unless cited by the examiner on form PTO-892, have not been considered.

Drawings

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "14" (Fig. 3) and "20" (Fig. 2) have both been used to designate the organic molecules. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

5. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "14" has been used to designate both an electrode conductor and the organic molecule in Figs. 3-5. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

6. The disclosure is objected to because of the following informalities: on page 24, in paragraph [0118] reference is made to a copending application but does not provide an application number. Applicant is reminded that no new matter may be introduced into the specification as such an amendment to the specification may constitute new matter since there is no clear indication of the specific application being referenced.

Appropriate correction is required.

Claim Objections

7. Claim 61 objected to because of the following informalities: the term "abou t" should be --about--. Appropriate correction is required.
8. Claims 9, 32, 51 and 62 objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. These claims recite that the products are "independently addressable" but fail to provide further structure defining their respective products. Thus in terms of the claimed invention, a product, claims 9, 32, 51 and 62 fail to further limit the subject matter of their respective previous claims.

Claim Rejections - 35 USC § 112

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
10. Claims 16, 22-24, 33-51, 67, 68 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
 - a. Claim 16 recites the limitation "said insulator" in line 1. There is insufficient antecedent basis for this limitation in the claim. Claim 1 recites the

phrase "non-conductor or semiconductor" but does not use the term insulator.

This also applies to claims 47, 67 and 68;

b. Claims 22 and 23 recite the limitation "said redox-active molecule". There is insufficient antecedent basis for this limitation in the claim;

c. Claim 24 recite the limitation "said organic molecule". There is insufficient antecedent basis for this limitation in the claim;

d. The term "typically about" in claim 33 is a relative term which renders the claim indefinite. The term "typically about" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The term does renders the range associated with this term indefinite since "typically about" also encompasses values which are not about this range. Therefore it is unclear as to what this limitation is defining and has been interpreted to include "atypical" values as well as typical values.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

12. Claims 1-4, 9, 13-14, are rejected under 35 U.S.C. 102(b) as being anticipated by Clark et al. "Electrochemical analysis in Picoliter Microvials" (hereafter referred to as Clark).

Clark discloses an electrochemical cell array comprising a plurality of electrochemical cells wherein a cell comprising said array is a well having a cross-sectional area wherein a wall of the well comprises a first and second electrodes separated by a non-conductive or semi-conductive layer wherein the ratio of the first electrode (carbon) to the reference electrode is about 5:1 (see paragraph bridging columns 1 and 2 on page 260) With respect to the cross-sectional area limitation: the manner in which the claim is written does not require that the cross-sectional limitation be the maximum area and thus encompasses a virtual area in the well which can be a portion of the total cross-sectional area and define a cross-section which is 1 square micron or less. Claim 1 as written does not preclude wells have cross-sectional areas greater than 1 square micron. In the case of Clark the glass capillary is made up of a plurality of cross-sections each of which are less than about 1 square micron. Further with respect to the term nanoscale in claim 1 any length can be scaled to nanometer dimensions. For example 10 micrometers is equivalent to 10,000 nanometers. The instant claim does not preclude such interpretation since the term nanoscale is not defined by bounds (as applied to claim 1).

The ratio of the electrodes being about 5:1 is predetermined (see paragraph bridging columns 1 and 2 on page 260 as applied to claims 2 and 3).

As with the cross-sectional limitation of claim 1, discussed above, the prior art has a plurality of volume segments each of which are less than about 1×10^{-14} L, the sum of each segment defining the total volume of the capillary well (as applied to claim 4).

Clark forms plural cells. The language of claim 9 being "independently addressable" does not positively require that the cells are independently addressed but only that the cells can be independently addressed. Thus the prior art cells of Clark are "independently addressable" (as applied to claim 9).

One of the electrodes is silver (page 260). The silver electrode can be either the first or second electrode in the context in which claims 1, 13 and 14 are written (as applied to claims 13 and 14).

The electrode is coated with phenol-allylphenol copolymer which is an insulator (top of second column on page 260 as applied to claim 16).

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view of either the admitted prior art relied upon in the instant application, U.S. patent No. 5,512,131 (Kumar) or U.S. patent No. 6,132,685 (Kersco).

The teachings of claim 1 have been discussed above and are incorporated herein.

The difference between instant claims 5 and 6 and Clark is that Clark does not specify the number of wells formed in the array.

The vials formed in accordance with the references 14-16 cited by Clark provide plural wells formed in a single substrate. Clark forms plural wells in the substrate (paragraph under "Results and Discussion" on page 260, as applied to claims 5 and 6).

Clark further teaches that the vial size can be manipulated by changing the photomask or controlling the etch depth.

The admitted prior art of the instant application, in particular, paragraphs [0123] and [0145] teach that a substrate having a array of wells is well known in the art and therefore is not held to be a significant or patentable contribution to the art. In addition Kumar shows a substrate having plural wells formed therein (see figures). See also Kersco Fig. 8 which shows a high throughput microwell array formed on a substrate.

The motivation for providing plural wells on a single substrate is to fabricate a high throughput screening array.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by providing plural wells on a single substrate is to fabricate a high throughput screening array.

15. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clark.

The teachings of claim 1 have been discussed above and are incorporated herein.

The difference between instant claims 7 and 8 and Clark is that Clark does not specify the center to center distances

The vials formed in accordance with the references 14-16 cited by Clark provide plural wells formed in a single substrate. Clark forms plural wells in the substrate (paragraph under "Results and Discussion" on page 260, as applied to claims 5 and 6).

Clark further teaches that the vial size can be manipulated by changing the photomask or controlling the etch depth.

The motivation for reducing the center to center distance between two wells is that it reduces the size of the electrochemical cell array.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by reducing the center to center distance between two wells in the device since it would have reduced the size of the electrochemical cell array.

16. Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view of Ball et al. "Electrochemistry in Nanovials Fabricated by Combining Screen Printing and Laser Micromachining", (hereafter referred to as Ball).

The teachings of claim 1 have been discussed above and are incorporated herein.

The difference between instant claims is of the electrodes comprising the walls of the vials.

Ball teaches of forming nanovials wherein the materials (electrodes, insulator, etc) are deposited on a substrate and then patterned to form nanovials (See Fig. 1).

The motivation for arranging the nanovials in the manner taught by Ball is that it provides an array which is inexpensive and allows for a great range of flexibility in the electrode geometry, in particular having embedded electrodes. Embedded electrodes alleviate the need to manipulate the electrodes into position.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by arranging the nanovials in the manner taught by Ball since it would have provided an array which is inexpensive and allowed for a great range of flexibility in the electrode geometry, in particular having embedded electrodes. Embedded electrodes alleviate the need to manipulate the electrodes into position.

17. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view of either the admitted prior art relied upon in the instant application or U.S. patent No. 5,622,872 (Ribi).

The teachings of claims 1 and 16 have been discussed above and are incorporated herein.

The difference between instant claim 17 and Clark is that Clark does not teach of the insulating material being silicon nitride or silicon oxide.

Clark teaches of providing an insulator material as discussed above with respect to claim 16.

Insulating materials such as silicon nitride and silicon oxide are well known in the art as admitted by applicant (see paragraph [0105]). Ribi also teaches that coating electrodes with an insulating layer of silicon oxide is well known in the art.

The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by using silicon nitride or silicon oxide as the insulating material since such materials are known to have excellent insulative properties and because it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

18. Claims 15, 18-22 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view of U.S. patent No. 5,942,388 (Willner).

The teachings of claim 1 have been discussed above and are incorporated herein.

The differences between instant claims are of the electrode being a semiconductor (claim 15) of a redox active molecule electrically coupled to the second electrode (claim 18), of the molecule being attached via a linker (claim 19) and a linker bearing a sulfur (claim 20) or alcohol (claim 21) of the molecule being selected from various groups (claim 22).

With respect to claim 15:

The electrode material of Clark is gold.

Willner teaches that while gold is a suitable electrode material, other materials such as indium tin oxide (a doped semiconductor) can be used in place of the gold electrode (col. 4, ll. 51-61).

The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by a semiconductive electrode material as taught by Willner since both gold and semiconductive materials are known electrode materials and both would provide the requisite required electrode functions and because it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

With respect to claims 18-21:

Willner discloses attaching a redox active molecule to an electrode via a linker bearing sulfur and an alcohol (see Fig. 17B for example as applied to claims 18-21).

The motivation for providing a redox active molecule to the electrode of Clark is that it provides an arrangement for application in diagnostics, food analysis and environmental analysis. The presence of the redox active molecule in the array aids in detecting antibodies, antigens, metabolites, herbicides, etc. (col. 1, ll. 51-58).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by providing a redox active molecule to the electrode of Clark since it would have provided an arrangement for application in diagnostics, food analysis and environmental analysis, and provided an arrangement used to detect and trace antibodies, antigens, metabolites, herbicides.

With respect to claim 22:

The material of the redox active molecule includes a 4,4'-bipyridyl (col. 4, ll. 63-67 as applied to claim 22).

The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by using the redox active compounds of Willner since it would have provided a material for measuring the analytes composition and because it has been held to be within the general skill of a

worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

With respect to claim 25:

A binder is electrically coupled to the electrode (see Figs. 12 a-c as applied to claim 25).

The motivation for providing a binder is to provide an analyte binding surface to the electrode.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by providing a binder to the electrode since it would have provided an analyte binding area to the electrode.

19. Claims 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view of Willner as applied to claims 15, 18-22 and 25 above, and further in view of WO 9705477 A1 (WO '477).

The difference not yet discussed are the redox active materials of claims 23 and 24.

WO '477 discloses that porphyrins and further porphyrinic macromolecules substituted at the beta or meso positions are known molecules used in a biosensor (page 6, II. 24-37).

The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in Sinclair & Carroll Co. v.

Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by using the redox active molecules of claims 23 and 24 such materials are known to have excellent redox activity and because it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

20. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view of Willner as applied to claims 15, 18-22 and 25 above, and further in view of U.S. patent No. 5,922,537 (Ewart).

The difference not yet discussed are the binding agent being a material selected from the genus of claim 26.

Willner teaches the need of a binding agent as a means for providing a surface for the analyte to adhere to the electrode.

The particular binder is selected relative to the analyte and the various species listed in claim 26 are known binding agents in biosensors, such as lectin (Ewart, col. 8, II. 1-39).

The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by selecting a particular binding agent since selection of the binding agent is dependent upon the analyte and modifying the specific to an analyte would have provided an optimal binder site for the analyte and because it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

21. Claims 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view of Willner as applied to claims 15, 18-22 and 25 above, and further in view of U.S. patent No. 5,476,797 (Matsunaga).

The reference electrode of Clark is silver (page 260).

The differences not yet discussed are the working electrode being gold (claim 27), of the second electrode having a redox-active molecule attached to it (claim 28), of a binder coupled to the second electrode (claim 29).

With respect to claim 27:

While Clark exemplifies carbon as the working electrode (page 260). However it is additionally known in the art to use gold in place of carbon as the working electrode without the loss of function of the working electrode (see Matsunaga, col. 7, ll. 42-57).

The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v.*

Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by replacing the carbon electrode with gold since it is known that both gold or carbon can be used as a working electrode and thus are held to be equivalent working electrode materials and because it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

With respect to claim 28:

Willner discloses attaching a redox active molecule to an electrode via a linker bearing sulfur and an alcohol (see Fig. 17B for example as applied to claim 28).

The motivation for providing a redox active molecule to the electrode of Clark is that it provides an arrangement for application in diagnostics, food analysis and environmental analysis. The presence of the redox active molecule in the array aids in detecting antibodies, antigens, metabolites, herbicides, etc. (col. 1, ll. 51-58).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by providing a redox active molecule to the electrode of Clark since it would have provided an arrangement for application in diagnostics, food analysis and environmental analysis, and provided an arrangement used to detect and trace antibodies, antigens, metabolites, herbicides.

With respect to claim 29:

A binder is electrically coupled to the electrode (see Figs. 12 a-c as applied to claim 29).

The motivation for providing a binder is to provide an analyte binding surface to the electrode.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by providing a binder to the electrode since it would have provided an analyte binding area to the electrode.

22. Claims 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view Willner and Matsunaga as applied to claims 27-29 above and in further view of either the admitted prior art relied upon in the instant application, U.S. patent No. 5,512,131 (Kumar) or U.S. patent No. 6,132,685 (Kersco).

The substrate is a silicon wafer (page 259, second column as applied to claim 31).

Clark forms plural cells. The language of claim 9 being "independently addressable" does not positively require that the cells are independently addressed but only that the cells can be independently addressed. Thus the prior art cells of Clark are "independently addressable" (as applied to claim 32).

The difference between instant claim 30 and Clark is that Clark does not specify the number of wells formed in the array.

The vials formed in accordance with the references 14-16 cited by Clark provide plural wells formed in a single substrate. Clark forms plural wells in the substrate (paragraph under "Results and Discussion" on page 260, as applied to claim 30).

Clark further teaches that the vial size can be manipulated by changing the photomask or controlling the etch depth.

The admitted prior art of the instant application, in particular, paragraphs [0123] and [0145] teach that a substrate having a array of wells is well known in the art and therefore is not held to be a significant or patentable contribution to the art. In addition Kumar shows a substrate having plural wells formed therein (see figures). See also Kersco Fig. 8 which shows a high throughput microwell array formed on a substrate.

The motivation for providing plural wells on a single substrate is to fabricate a high throughput screening array.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by providing plural wells on a single substrate to fabricate a high throughput screening array.

23. Claims 52, 56, 57, 58, 62, 66, 67 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view of U.S. patent No. 5,942,388 (Willner).

Clark discloses an electrochemical cell array comprising a plurality of electrochemical cells wherein a cell comprising said array is a well having a cross-sectional area wherein a wall of the well comprises a first and second electrodes separated by a non-conductive or semi-conductive layer wherein the ratio of the first electrode (carbon) to the reference electrode is about 5:1 (see paragraph bridging

columns 1 and 2 on page 260) With respect to the cross-sectional area limitation: the manner in which the claim is written does not require that the cross-sectional limitation be the maximum area and thus encompasses a virtual area in the well which can be a portion of the total cross-sectional area and define a cross-section which is 1 square micron or less. Claim 1 as written does not preclude wells have cross-sectional areas greater than 1 square micron. In the case of Clark the glass capillary is made up of a plurality of cross-sections each of which are less than about 1 square micron. Further with respect to the term nanoscale in claim 1 any length can be scaled to nanometer dimensions. For example 10 micrometers is equivalent to 10,000 nanometers. The instant claim does not preclude such interpretation since the term nanoscale is not defined by bounds (as applied to claim 52).

The ratio of the electrodes being about 5:1 is predetermined (see paragraph bridging columns 1 and 2 on page 260 as applied to claims 56 and 57).

As with the cross-sectional limitation of claim 1, discussed above, the prior art has a plurality of volume segments each of which are less than about 1×10^{-14} L, the sum of each segment defining the total volume of the capillary well (as applied to claim 58).

Clark forms plural cells. The language of claim 9 being "independently addressable" does not positively require that the cells are independently addressed but only that the cells can be independently addressed. Thus the prior art cells of Clark are "independently addressable" (as applied to claim 62).

The electrode is coated with phenol-allylphenol copolymer which is an insulator (top of second column on page 260 as applied to claim 67).

The substrate is silicon (page 259, second column as applied to claim 70).

The differences between instant claims are: of a binding partner being electrically coupled to the second electrode (claim 52); of the electrode being a semiconductor (claim 66).

With respect to claim 52:

A binder is electrically coupled to the electrode (see Figs. 12 a-c as applied to claim 25).

The motivation for providing a binder is to provide an analyte binding surface to the electrode.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by providing a binder to the electrode since it would have provided an analyte binding area to the electrode.

With respect to claim 66:

The electrode material of Clark is gold.

Willner teaches that while gold is a suitable electrode material, other materials such as indium tin oxide (a doped semiconductor) can be used in place of the gold electrode (col. 4, ll. 51-61).

The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by a semiconductive electrode material as taught by Willner since both gold and semiconductive materials are known electrode materials and both would provide the requisite required electrode functions and because it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

24. Claim 53 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view of Willner as applied to claim 52 above, and further in view of U.S. patent No. 5,922,537 (Ewart).

The difference not yet discussed are the binding agent being a material selected from the genus of claim 53.

Willner teaches the need of a binding agent as a means for providing a surface for the analyte to adhere to the electrode.

The particular binder is selected relative to the analyte and the various species listed in claim 26 are known binding agents in biosensors, such as lectin (Ewart, col. 8, II. 1-39).

The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by selecting a particular binding agent since selection of the binding agent is dependent upon the analyte and modifying the specific to an analyte would have provided an optimal binder site for the analyte and because it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

25. Claims 54 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view of Willner as applied to claim 52 above, and further in view of U.S. patent No. 6,066,448 (Wohlstadtler).

The difference not yet discussed are the sensor comprising at least 2 binding species (claim 54) and further at least 10 binding species (claim 55), each species being in a different well.

Willner teaches the need of a binding agent as a means for providing a surface for the analyte to adhere to the electrode.

The particular binder is selected relative to the analyte and the various species listed in claim 26 are known binding agents in biosensors, such as lectin (Ewart, col. 8, II. 1-39).

Different or identical binding reagents may be present in a plurality of capillaries and/or multiple distinct binding agents may be present in a given capillary.

The motivation for providing different binding partners in different wells is that it provides discrete binding domains across the array which are capable of binding to a wide range of analyte materials.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by providing different binding partners in different wells is that it provides discrete binding domains across the array which are capable of binding to a wide range of analyte materials.

26. Claim 59 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view Willner as applied to claim 52 above, in further view of either the admitted prior art relied upon in the instant application, U.S. patent No. 5,512,131 (Kumar) or U.S. patent No. 6,132,685 (Kersco).

The difference between instant claim 59 and Clark is that Clark does not specify the number of wells formed in the array.

The vials formed in accordance with the references 14-16 cited by Clark provide plural wells formed in a single substrate. Clark forms plural wells in the substrate (paragraph under "Results and Discussion" on page 260, as applied to claim 59).

Clark further teaches that the vial size can be manipulated by changing the photomask or controlling the etch depth.

The admitted prior art of the instant application, in particular, paragraphs [0123] and [0145] teach that a substrate having a array of wells is well known in the art and

therefore is not held to be a significant or patentable contribution to the art. In addition Kumar shows a substrate having plural wells formed therein (see figures). See also Kersco Fig. 8 which shows a high throughput microwell array formed on a substrate.

The motivation for providing plural wells on a single substrate is to fabricate a high throughput screening array.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by providing plural wells on a single substrate is to fabricate a high throughput screening array.

27. Claim 60 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view Willner as applied to claim 52 above and in further view of U.S. patent No. 6,300,141 (Segal).

The difference not discussed is of the wells being connected to a microchannel.

A plurality of separate biosensors can be arranged, preferably on a planar substrate, to receive sample fluid delivered from microchannels emanating from a central sample application area (FIG. 8C, Segal).

The motivation for connecting the wells to a microchannel is to allow fluid communication of the analyte from the source to the wells wherein the analyte is measured.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by connecting the wells to a microchannel is to allow fluid communication of the analyte from the source to the wells wherein the analyte is measured.

28. Claim 61 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view of Willner as applied to claim 52 above.

The difference between instant claim 61 and Clark is that Clark does not specify the center to center distances

The vials formed in accordance with the references 14-16 cited by Clark provide plural wells formed in a single substrate. Clark forms plural wells in the substrate (paragraph under "Results and Discussion" on page 260, as applied to claim 61).

Clark further teaches that the vial size can be manipulated by changing the photomask or controlling the etch depth.

The motivation for reducing the center to center distance between two wells is that it reduces the size of the electrochemical cell array.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by reducing the center to center distance between two wells in the device since it would have reduced the size of the electrochemical cell array.

29. Claims 63 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view of Ball et al. "Electrochemistry in Nanovials Fabricated by Combining Screen Printing and Laser Micromachining", (hereafter referred to as Ball).

The difference between instant claims is of the electrodes comprising the walls of the vials.

Ball teaches of forming nanovials wherein the materials (electrodes, insulator, etc) are deposited on a substrate and then patterned to form nanovials (See Fig. 1).

The motivation for arranging the nanovials in the manner taught by Ball is that it provides an array which is inexpensive and allows for a great range of flexibility in the electrode geometry, in particular having embedded electrodes. Embedded electrodes alleviate the need to manipulate the electrodes into position.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by arranging the nanovials in the manner taught by Ball since it would have provided an array which is inexpensive and allowed for a great range of flexibility in the electrode geometry, in particular having embedded electrodes. Embedded electrodes alleviate the need to manipulate the electrodes into position.

30. Claims 65 and 69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view of Willner as applied to claims 15, 18-22 and 25 above, and further in view of U.S. patent No. 5,476,797 (Matsunaga).

The reference electrode of Clark is silver (page 260).

The differences not yet discussed are the working electrode being gold (claims 65 and 69).

While Clark exemplifies carbon as the working electrode (page 260). However it is additionally known in the art to use gold in place of carbon as the working electrode without the loss of function of the working electrode (see Matsunaga, col. 7, ll. 42-57).

The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in Sinclair & Carroll Co. v.

Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by replacing the carbon electrode with gold since it is known that both gold or carbon can be used as a working electrode and thus are held to be equivalent working electrode materials and because it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

31. Claim 68 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clark in view of either the admitted prior art relied upon in the instant application or U.S. patent No. 5,622,872 (Ribi).

The difference between instant claim 68 and Clark is that Clark does not teach of the insulating material being silicon nitride or silicon oxide.

Clark teaches of providing an insulator material as discussed above with respect to claim 67.

Insulating materials such as silicon nitride and silicon oxide are well known in the art as admitted by applicant (see paragraph [0105]). Ribi also teaches that coating electrodes with an insulating layer of silicon oxide is well known in the art.

The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v.

Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Clark by using silicon nitride or silicon oxide as the insulating material since such materials are known to have excellent insulative properties and because it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

Allowable Subject Matter

32. Claim 33 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action.

33. The following is a statement of reasons for the indication of allowable subject matter: none of the prior art of record are considered to teach, suggest or render obvious the invention of claim 33.

The prior art of Clark is drawn to analytical measurements in biological and medicinal applications. There is no teaching or suggestion of the device of Clark being a molecular memory device for storage of data. One of ordinary skill in the art would not have found it obvious to modify the teachings of Clark to be a molecular memory device since the application of the array of Clark is drawn to a distinctly different field of endeavor, in particular biological and medicinal analyte analysis.

None of the remaining prior art of record appear to teach or suggest the molecular memory device of claim 33.

Conclusion

34. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is (703) 305-0635. The examiner can normally be reached on Monday through Thursday from 8:00 a.m. to 5:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan, can be reached on (703) 308-2383. FAX communications should be sent to the appropriate FAX number: (703) 872-9311 for After Final Responses only; (703) 872-9310 for all other responses. FAXES received after 4 p.m. will not be processed until the following business day. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Gregg Cantelmo
Patent Examiner
Art Unit 1745

gc



August 9, 2003